bright golden disc of the Moon, when the planet was half out, and, in addition to this, the distinctness of the principal belts.

[The planet was not discernible in a good opera glass previous to immersion, but on the occasion of the last occultation in broad daylight, May 24, 1860, at $4\frac{1}{2}^h$, the disappearance could be seen without difficulty by means of an old ship glass, power 16, sheltered from the Sun's rays.]

Vicarage, Melplash, Dorset:
August 9.

Orbit of Comet III. of 1888. By Lieut.-Gen. J. F. Tennant, R.E., F.R.S.

This comet was discovered by Mr. Brooks on August 7, when it had already passed its perihelion seven days. The first accurate observation of it I have found is at Carleton College on the following day, but it is alone, and therefore I have not used it in my work, as it promised to complicate the deduction of the normal places. The comet was extensively observed till September 12, after which date the observations are fewer, and after October 10 I have only observations at Paris on two days, which I owe to the courtesy of Admiral Mouchez, Director of the Observatory, who sent me all the observations there in MS. I am also indebted to Mr. Plummer, of Orwell Park Observatory, for MS. observations, since published in the *Monthly Notices*.

I have examined all observations I could find in the *Astronomische Nachrichten*, Gould's *Journal*, *Monthly Notices*, *Comptes Rendus*, *Bulletin Astronomique*, and *Sidereal Messenger*. I have generally omitted to use all which depended on *Durchmusterung* stars; those of October 24 at Paris, however, are an exception, for I was unwilling to trust entirely to the observation of October 27 for a last normal place, though it would have agreed better with my final orbit than that I actually deduced.*

From the observations at Strassburg on August 10, at Kiel on September 1, and Dresden on September 23, I deduced a parabolic orbit.

$$T = \text{July } 31{\cdot}109783 \text{ G.M.T.}$$

$$\log q = 9{\cdot}9551934$$

$\Omega = 101^\circ\ 29'\ 45''{\cdot}0$	Ecliptic and equinox of 1888·0.		$\Omega' = 94^\circ\ 05'\ 42''{\cdot}38$	Equator and equinox of 1888·0.	
$\pi = 160\ 39\ 05{\cdot}1$			$\pi' = 177\ 37\ 07{\cdot}00$		
$i = 74\ 11\ 37{\cdot}5$			$i' = 70\ 57\ 41{\cdot}32$		

By comparing an orbit almost identical † with this with the

* The observations at Padua on August 12, and at Brussels on August 27, seem to be erroneously printed, and have been rejected.

† The difference arose from an error in copying a figure, and was very slight.

observations, and combining them, first into daily groups and then into groups of several days, I obtained, using only first powers of the time intervals in solving the equations of condition, the following eight normal places, to which were assigned weights nearly proportional to the number of observations used for them. That is, to Nos. 1, 2, and 3 each 2, to Nos. 4 and 5 each 1·5, to Nos. 6 and 7 each 1, and to No. 8 0·15.

No.	Observations.	No.	Date.	True α.	True δ.
				° ′ ″	° ′ ″
1	Aug. 9–12	36	Aug. 10·5	157 37 37·0	+44 50 45·1
2	13–24	34	17·5	171 16 42·0	43 57 38·9
	25–31	34	28·5	191 55 49·2	39 08 06·6
4	Sept. 1–6	24	Sept. 4·5	203 19 24·2	34 23 28·3
5	7–17	20	12·5	214 19 08·7	28 13 18·1
6	23–30	14	26·5	229 11 32·8	17 33 25·0
7	Oct. 1–10	15	Oct. 5·5	236 38 59·5	11 34 55·6
8	24–27	2	25·5	249 42 53·1	1 22 57·4

Equations of condition having been formed for each observation, normal equations were formed and solved in the usual way, giving the following corrections to the elements :—

$$\delta T = -0^{d}\cdot014614 \pm 0\cdot014811$$
$$\delta \log q = -0\cdot0001320 \pm 0\cdot0000903$$
$$\delta e = -0\cdot0021225 \pm 0\cdot0007193$$
$$\delta \Omega' = +43''\cdot57 \pm 13\cdot04$$
$$\delta \pi' = -4\cdot95 \pm 68\cdot24$$
$$\delta i' = +30\cdot77 \pm 11\cdot66$$

The separation of δT and $\delta \pi'$ in the elimination is very uncertain, and the probable errors of the elements mainly arise from the uncertainty of T which was left to the last.

The probable error of δe is about one-third of its amount, whence it would appear that the orbit is really elliptic, though the eccentricity is very uncertain. Had the comet been discovered a few days sooner, and observed about perihelion, we might have had doubts removed.

The resulting elements are :—

Perihelion passage, July 31, ·095169; July 31, $2^h\ 17^m\ 02^s\cdot6$.

$$\log q = 9\cdot9550614$$
$$e = 0\cdot9978775$$

$\Omega' = 94^\circ\ 06'\ 25''\cdot95$
$\pi' = 177\ 37\ 02\cdot05$
$i' = 70\ 58\ 12\cdot09$
} Equinox and equator of 1888·0.

Computing from these elements the places at the times of

the normals, we have the following values of observation-computation.

δ R.A.	+2″·3	−2″·3	−1″·8	−0″·8	−3″·1	+4″·8	+3″·8	−15″·8
Dec.	+3·6	−0·3	−3·9	−0·4	+1·9	+2·6	+3·4	+5·4

The probable error of one of the constants of the equations of condition of the weight 1 is found 3″·18, and on the whole the observations seem satisfactorily represented.

The ecliptic elements are finally:—

	d	d h m
T = July	31·0952	= July 31 2 17
Ω =	101° 30′ 11″	
π =	160 38 50	
i =	74 12 23	
log *q* =	9·9550614	
e =	0·9979	

Brooks's Comet. By J. I. Plummer, M.A.

Some recent observations which I have made of the two portions of Brooks's Comet seem to point to even greater interest than the actual division of the comet may have caused. The only fragment of the main body which I have been able to see at Orwell Park is the intermediate one of the three illustrated in the *Astronomische Nachrichten*, No. 2922, from the Vienna observations. During the month of September I succeeded in making eight sets of comparisons between the main body and this fragment which show a gradual increase in the distance both in R.A. and declination, but the rate of movement of separation was distinctly slower than in the previous month. Later I succeeded in making four similar sets of comparisons between October 17 and October 24, at which times I found that the fragment had greatly diminished in lustre relatively to the main comet, and also that the differences of R.A. and declination had certainly lessened, indicating an actual motion of approach. I should be very glad to have this fact verified by other observers, and as it appears probable that after the present bright moonlight the light will be still less, I would suggest that the matter is of sufficient interest to induce the possessors of large telescopes to pay attention to this comet without delay. I would add that it would appear that the period at which the greatest divergence took place is that of perihelion passage, i.e. September 26. The observations to which I have referred will be published in due course.

1889, *November* 8.
